University of California
Lawrence Livermore National Laboratory
Laser Programs Directorate
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Livermore's Laser Programs comprise the world's premier center for lasers and electro-optics R&D

Mission

Livermore is a world leader in laser and electro-optic science, engineering, and technology. We are applying this expertise to meet national needs in the diverse areas of energy, the environment, the economy, and defense. We are extending our collaborations with industry and other institutions to identify technologies that can be developed and transferred to the private sector.

Technical Diversity and Unique Programs

Our principal laser projects derive from the core intellectual and technical capabilities developed for national security and involve the full complement of Livermore's multidisciplinary expertise. We have two long-standing major programs:

• **The Inertial Confinement Fusion (ICF) Program** has made great advances in understanding the scientific principles of ICF. Livermore's Nova laser is the principal experimental tool for our ICF activities. We are advancing ICF technology as an environmentally clean source of energy, providing improved understanding in many areas of basic science, and contributing to economic and national security. The next-generation ICF laser facility, the National Ignition Facility, is now under development at Livermore, in conjunction with the Los Alamos and Sandia national laboratories and the University of Rochester.

• **The Isotope Separation and Advanced Manufacturing Program** has two components: atomic vapor laser isotope separation (AVLIS) and advanced manufacturing. AVLIS is directed primarily toward the development of low-cost, environmentally responsible enrichment of uranium for fission reactor fuel; we are currently transferring the AVLIS technology for uranium enrichment to the private sector. Our advanced manufacturing activities are directed toward the development and demonstration of innovative uses for AVLIS technology.

In addition, we are further developing very successful programs in the areas of:

• Imaging and detection.
• Advanced microtechnology.
• Remote sensing.

Besides major contributions in basic science, technology, and applications over the past decade, these programs have provided significant advances in:

• Optics
• Diagnostics and sensors
• Materials handling and processing
• Microfabrication, microelectronics, and information technologies.
• Plasma physics and fusion research.

Derivative Applications

Numerous derivative applications of our scientific base and expanding technologies are being assessed and pursued as potential new programs in such areas as:

- Micropower impulse radar (radar on a chip)
- Soft-x-ray projection lithography
- Laser tracking and adaptive optics for astronomy applications.
- Diode-pumped solid-state lasers
- Short-pulse high-irradiance lasers.
- Remote materials handling.
- Materials processing.
- Laser and radar remote sensing.
- X-ray lasers.
- Tactical battlefield weapons.

Recent Accomplishments

- Development of the Nova laser, the world's most powerful and continuously operating laser.
- Development of world-leading laser technology and applications.
- Development of new technologies and techniques for safely maintaining the U.S. nuclear stockpile without underground testing.
- Research assessing the feasibility of inertial fusion energy as a long-term, clean energy source.
- Development of ICF optics technology, which was applied by a U.S. company in making to the corrective lenses for the Hubble Space Telescope.
- High-energy-density research providing insights into the origin of matter and the universe.
- Invention of low-cost, micropower impulse radar with extensive automotive, industrial, health care, and security applications.
- Development of micromanufacturing technologies leading to smaller computer chips and circuits.
- Development, demonstration, and transfer of technology to industry of a low-cost uranium-enrichment technology (AVLIS) for fuel for nuclear power plants.
- First demonstration of laboratory x-ray lasers and first production of three-dimensional x-ray holographic images.

Internationally Recognized Technical Staff

The scientific and technical excellence of our Laser Programs staff is widely recognized nationally and internationally. Our researchers include 36 fellows of professional research societies. Over the years, Laser Programs personnel have received two Maxwell awards, four Excellence in Plasma Physics awards, four E. O. Lawrence awards, three Edward Teller awards, and 25 R&D 100 awards, among others. Livermore's contributions in laser technology and its applications range from new visions in industry and defense to micro-optics for improving human vision. Our skill in translating this knowledge base into outstanding technological innovation is a vital characteristic and continuing goal of the Laser Programs.

Contact

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